In 1907 there was a decided falling off in number, with respect to diseased as well as healthy plants, the proportion of the former being plainly less than in the preceding season.

On account of the obscure nature of this type of disease, its similarity to aster yellows and kindred troubles, and more particularly on account of the abundance and availability of the material a series of observations and experiments covering a number of years were planned. The outcome of one of these experiments was as follows:

In September, 1906, a number of vigorous, healthy young plants were carefully taken up and transplanted to the corner of a garden. They were placed close together, making a continuous row four or five feet long. Next plants showing early or at least not advanced stages of yellows were selected and transplanted with equal care so as to form a row on either side, parallel with, and about six or eight inches removed from, the row of diseased plants. None of the plants showed any ill effects from the transplanting. In the spring of 1907 nearly all of the diseased plants were dead and the remainder failed to survive the season. All of the healthy plants survived. They have shown no signs of yellows to date and are now strong and vigorous. A portion of the plants will now be removed from the row and placed in the rows where the diseased plants stood.

It is hoped that later work upon this disease of a more fundamental nature may be undertaken with added facilities in the shape of a greenhouse for pathological purposes and complete equipment for histological work.

W. J. MORSE

MAINE EXPERIMENT STATION

A PRINCIPLE OF ELEMENTARY LABORATORY TEACHING FOR CULTURE STUDENTS

DURING recent years, courses for culture students in the biological sciences have been widely introduced into the schools and colleges of this country. The results attained do not measure up to what was hoped for by those who placed them there. Probably no one would be more ready than the better teachers to admit that the average student, to a discouraging degree, comes short of acquiring that information or developing that power of obtaining knowledge for himself which it was planned that he should.

The difficulty is not trivial and it is not imaginary. It is one which should receive serious consideration at the hands of those whose business it is to teach. The present paper is offered as a contribution toward its solution.

One university professor of botany expressed to the writer the opinion that courses in botany are justified by the fact that some who are not adapted to other studies are awakened and develop in scientific work. The writer has known shining examples of such; their proportion, however, is small, and it seems self-evident that the teacher can be content with nothing less than to reach and to bring out the average student who comes into his classes.

The situation can best be stated by taking a concrete illustration. Suppose then, a young teacher with university training, high ideals and a certain individuality. He surrounds himself with his students, places material in their hands and asks them stimulating questions whose answers they can find out. He plans courses which include morphology, physiology and evolutionary relationship of plants. These subjects are sometimes segregated, sometimes (as their arranger thinks) ingeniously interwoven. The teaching proceeds through weeks and months. Looked at as a whole, what is the outcome? Something as follows:

The success of certain of the lessons is immediate and convincing. Perhaps, for example, those upon the morpho-physiology of seeds or upon winter buds, catch the interest of the class, incite independent effort and show every sign of living in the minds of the student. On such days the teacher tastes that fine joy which is said to be his chief reward, mingled it may be with sinful pride and a commiseration for students less fortunate than his own.

But not so much can be said of every lesson. For these the teacher frames for himself many excuses. Perhaps it was an "off day." But as the years pass by and his experience and frankness with himself increase, he is some day to realize that as a matter of fact the hours when actual independent work is being done are few and precious, and that the greater part of the laboratory time is spent in merely performing assigned tasks.

No doubt there are teachers who lift their classes above this level, but no doubt also they are few. And if such is the case, then some hard things remain to be said, viz., that for the majority of students the time given to biological courses must be justified by the information acquired, or else by the disciplinary value of doing required routine work, or else that it is not justified at all.

If conditions are as pictured, the question is pressing—"What is to be done about it?" In looking for a solution my point of departure would be the fact that *certain* of the lessons actually do call out a real interested and independent effort on the part of the student. That ounce of fact is worth tons of theorizing. Then if it is true that the greatest good which can come to the student out of such courses is the development of his own powers of obtaining knowledge, it would not seem far to this principle. *The laboratory course should be composed mainly of those lessons which the instructor can so present as to arouse independent effort on the part of the student.*

Then the question will at once arise "what about the lessons of which this is not true; what about the many and important topics in which the student can at best scarcely do more than to perform faithfully the task assigned?" My answer would be to remove most of them frankly to the domain of lecture and demonstration. A good demonstration, where the student feels the spark of inspiration from the teacher's performance and example, is far better for both teacher and student than a time-serving laboratory exercise. In our haste to emphasize the laboratory method we have swung too far the other way and made too little of what must ever be one of the prime factors of good teaching—the inspiring example of the teacher.

No doubt a certain proportion of laboratory lessons which are mere verification exercises are desirable, but on the whole it still remains true that for culture students *the laboratory hours are too precious to be used in anything but independence begetting work.* In the lecture room is the place to see that the course is rounded out, kept coherent and the ground covered.

It may be permissible to add here a point which in the writer's experience has been worked out as a sort of corollary to the above principle. In blindly attempting to keep the students interested and working on their own initiative, I have found the laboratory work to grow more and more physiological in character.

In studying life histories, for example, I have found my classes to maintain a rather high degree of interest from the algæ up to about the ferns, and then the interest to wane as the homologies with the seed plants are taken up. After some time I perceived that that which held their interest was in the processes rather than in the organs of reproduction; that though they learned something about the homologies of endosperm, prothallus, etc., they did so under some pressure and forgot it with alacrity; and that in their hearts they did not care whether it was so or not. Slowly and with regret I came to the conclusion that in my classes at any rate the "deeper morphology" could not compete with other topics for a place in an elementary course.

Far otherwise was it with subjects which at first I had not had the students really work at all—respiration, photosynthesis, irritability. Here the interest and willingness to work was instantaneous and sustained. When it is considered furthermore that the teacher can give more just and stimulating criticism of the setting up of an experiment than he can of the performance of a dissection; that that which is permanently remembered by the student is after all very little,

and that ideas of the life activities of plants are among the most valuable in the subject-matter of botany, the case seems fairly complete for a course dominated by physiology.

In mentioning this seeming corollary I would not have it confounded with the principle which is here advanced. The principle should hold at all events. If a given teacher finds his classes to be most interested and to work hardest in morphology, then morphological problems should claim the laboratory time. The principle is to make any needful sacrifice in order to achieve the main object, to keep the student at his maximum of interest and independent effort.

CHARLES H. SHAW

SOCIETIES AND ACADEMIES

THE NEW YORK ACADEMY OF SCIENCES, SECTION OF GEOLOGY AND MINERALOGY

AT the regular monthly meeting of February 3, 1908, the following program was presented:

On Determination of Mineral Constitution through Recasting of Analyses: ALEXIS A. JULIEN.

The results of investigations continued along the line of complex mineral micro-aggregates, brought before the academy at the January meeting, were shown in a series of charts. It appears certain in the case of very complex mineral analyses, after giving due weight to the physical characters and origin of the substances, together with the readiness with which these analyses yield to the process of recasting, that many so-called mineral species are in reality very complex micro-aggregates. One illustration, taken from the complete paper, which is to be issued in the *Annals* of the New York Academy of Sciences, Vol. XVIII., Part II., No. 3, is here given as a suggestive case.

Diabantite, from Farmington Hills, Conn.: Mean of two analyses by G. W. HAWES.

		Per Cent
Silica	SiO_2	33.46
Alumina	Al_2O_3	10.96
Ferric oxide	Fe_2O_3	2.56
Ferrous oxide	FeO	24.72
Manganous oxide	MnO	.39
Lime	CaO	.92
Magnesia	MgO	16.52
Soda	Na_2O	.29
Water	H_2O	9.96
Total		99.78

This is said, by the analyst, to be "a unisilicate of the pyrosclerite group, with the formula,

$$(\tfrac{2}{3}\dot{R}_3 + \tfrac{1}{3}\dddot{Al})\ddot{Si}_3 + 3\dot{H}."$$

Dana states that the figures "correspond to the formula $R_{12}(R_2)_2Si_9O_{36} + 9aq$, which is near to that of pyrosclerite," and also

"*Comp.* $H_{18}(FeMg)_{12}Al_4Si_9O_{45}$, or

$$12(FeMg)O\ 2Al_2O_3\ 9SiO_3\ 9H_2O."$$

In the recalculation Dr. Julien assumes for the residual pyroxene the same composition as was determined by Hawes for that mineral from an outcrop of diabase in the same region. On this basis the following hypothetical constituents are indicated:

	Per Cent.
Pyroxene (residual)	6.78
Enstatite (residual)	10.45
Prochlorite	54.45
Ekmanite	16.33
Deweylite	8.42
Limonite	2.99
Periclase (magnesia)	0.36

It is apparent by making further comparison that diabantite is not identical with diabantachronyn, and it is not at all likely that any specimens of either mixture are ever identical.

The Annual Meeting of the Geological Society of America, Albuquerque, N. M., December 30–31, 1907: E. O. HOVEY.

An account of the chief points of interest in connection with the meeting was given.

A Revised Cross-section of the Rondout Valley along the Line of the Catskill Aqueduct: CHARLES P. BERKEY.

Explorations of the Board of Water Supply of New York City are now almost completed across the Rondout Valley. There are twelve distinct formations of stratified rock involved, all of which will be cut by the projected pressure tunnel. One unconformity in the series separates the Ordovician Hudson River slates from the overlying conglomerates, shales, sandstones and limestones of Silurian and Devonian age. There are three faults of considerable displacement, together with smaller ones and minor foldings. In the effort to determine the variations of these formations as to thickness, depth from surface, displacements, physical conditions, water content and capacity, the presence of caves or relative solubility, and the position and depth of the buried channels beneath the drift cover, the available figures are